

**REMARKS****A. Status of the Claims**

Claims 1-37 are pending in the application. Claims 1-7, 14, and 18 were rejected under 35 USC 102(b) as being anticipated by Oota et al., EP 0359886. Claim 9 is rejected under 35 USC 103(a) as being unpatentable over Oota et al. in view of Huff et al, US Patent No. 5,950,107. Claims 8, 10-13, 15-17, and 19 were rejected under 35 USC 103(a) as being unpatentable over Oota et al. Claims 20-37 are withdrawn from consideration.

**B. 35 USC 102(b) Rejections: Oota et al.**

Claims 1-7, 14, and 18 were rejected under 35 USC 102(b) as anticipated by Oota et al. Note that in the Office Action of September 15, 2004, the Examiner refers to this reference as "Mimura et al." European Patent Application 0395886, however, lists six inventors. The first named inventor is Oota, Yoshinori, while the third is Mimura, Yoshiyuki. Applicants presume this to be the intended reference, and will refer to it herein as Oota et al.

As amended, claim 1 recites a method for making a semiconductor device, comprising providing a metal structure comprising tungsten on a substrate; providing an insulating layer over the metal structure; providing a capping structure over the insulating layer; and annealing the resulting structure, wherein a portion of the metal structure has a width greater than about 1 micron.

As amended, claim 14 recites a method for preventing peeling of a metal structure in a semiconductor device, comprising providing a metal structure comprising tungsten on a substrate; providing an insulating layer over the metal structure; providing a capping structure over the insulating layer; and annealing the resulting structure, wherein a portion of the metal structure has a width greater than about 1 micron.

The conductive layer 202 of Oota et al. in Figs. 30A-30C is tantalum, and does not comprise tungsten. Further, there is no teaching in Oota et al. regarding the patterned *width* of conductive layer 202. Oota et al. therefore fail to teach each and every limitation of claims 1 and 14 as amended, and thus also fail to teach each and every limitation of dependent claims 2-7.

Claim 18 has been cancelled.

Applicants have shown that claims 1-7 and 14 distinguish over the teachings of Oota et al. and request that the 102(b) rejection of these claims be withdrawn.

**C. 35 USC 103(a) Rejection: Oota et al. in view of Huff et al.**

Claim 9 was rejected under 35 USC 103(a) over Oota et al. in view of Huff et al. Claim 9 has been cancelled.

**D. 35 USC 103(a) Rejections: Oota et al.**

Claims 8, 10-13, 15-17, and 19 were rejected under 35 USC 103(a) as being unpatentable over Oota et al.

Regarding claim 10, amended claim 1 includes the limitations of original claims 9 and 10, with the word “dimension” from original claim 10 changed to “width”. To further prosecution, Applicants will address the rationale for the 103 rejection of original claim 10 as it might be applied to amended claim 1.

Claim 1 recites a method for making a semiconductor device, comprising: providing a metal structure comprising tungsten on a substrate; providing an insulating layer over the metal structure; providing a capping structure over the insulating layer; and annealing the resulting structure, wherein a portion of the metal structure has a width greater than about 1 micron.

In rejecting original claims 8, 10-13, 15-17, and 19, the Examiner says:

Mimura et al. [Oota et al.] ... discloses the invention substantially as claimed.  
However, Mimura et al. ... does not explicitly teach a specific range of

annealing time with a temperature range or a range of thickness for the metal layer in the device. Nevertheless, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the semiconductor device of Mimura et al. with a specific range of time and temperature for annealing the device

Applicants cannot agree that Oota et al. disclose the invention of claim 1 substantially as claimed. Claim 1 includes the limitations that the metal structure a) comprises tungsten and b) has a width greater than about 1 micron.

First, in referring to "thickness" in this rejection, the Examiner has apparently assumed the original word "dimension" to refer to the thickness of the metal structure, rather than to a patterned dimension. The word "dimension" is replaced with "width" in this response to clarify that a width, not a thickness, greater than about 1 micron is intended.

As explained in the present application, tungsten structures can often peel, delaminating from the underlying structure, during heat treatments and especially during aggressive heat treatments, e.g., those lasting for about 1 minute at a temperature of about 800°C. This problem can be particularly acute for large areas of tungsten, for example areas having a width about 1 micron or more. A conventional approach to this problem is to avoid it, establishing design rules that prohibit the use of tungsten features having a width of about 1 micron or more.

Oota et al. nowhere teach tungsten structures having a width of about 1 micron or more. Oota et al. are silent regarding the surface dimensions of patterned features, and nowhere mention the use of tungsten. The dangers of tungsten peeling render the substitution of tungsten for tantalum (as used by Oota et al.) at the dimensions of the claim far from obvious.

Further, Oota et al. fail to teach each and every element of the claim. No explicit anneal step following deposition of a capping layer is taught by Oota et al.

A similar rationale applies to the 103(a) rejection of claims 8, 10-13, 15-17, and 19.

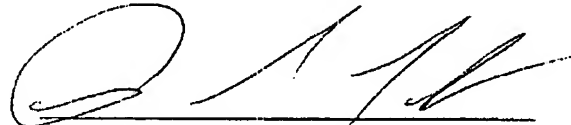
Applicants have shown that the references fail to teach or suggest each and every limitation of the rejected claims, and thus respectfully request reconsideration.

**CONCLUSION**

In view of the preceding Remarks, Applicants submit that this application is in condition for allowance. Reconsideration is respectfully requested. If objections remain, Applicants **respectfully request an interview**. In the event that objections remain, the Examiner is invited to contact the undersigned Agent for Applicants at 408-869-2921.

12/14/04  
Date

Respectfully submitted,



Pamela J. Squyres  
Agent for Applicants  
Reg. No.: 52,246

Matrix Semiconductor  
3230 Scott Blvd  
Santa Clara, CA 95054  
Tel. 408-869-2921